Chapter 10 Meiosis and Sexual Life Cycles Exam

Name _____ date _____

I. Multiple-Choice Questions

1. ____If a horticulturist breeding gardenias succeeds in having a single plant with a particularly desirable set of traits, which of the following would be her most probable and efficient route to establishing a line of such plants?
A) Backtrack through her previous experiments to obtain another plant with the same traits.
B) Breed this plant with another plant with much weaker traits.
C) Clone the plant asexually to produce an identical one.
D) Force the plant to self-pollinate to obtain an identical one.

2. ____Which of the following descriptions correctly defines a genome?
A) representation of a complete set of a cell's polypeptides
B) the complete set of an organism's polypeptides
C) a karyotype
D) the complete set of an organism's genes

3. ____ Which of the following is the smallest unit that would contain a complete copy of the entire human genome?
A) one human somatic cell
B) one human chromosome
C) all of the DNA of one human
D) one human gene

4. ____ If an organism is diploid and a certain gene found in the organism has 18 known alleles (variants), then any given organism of that species can/must have which of the following?
A) at most, 2 alleles for that gene
B) up to 18 chromosomes with that gene
C) up to 18 genes for that trait
D) up to, but not more than, 18 different traits

5. ____ Which of the following is a true statement about sexual versus asexual reproduction?
A) Asexual reproduction, but not sexual reproduction, is characteristic of plants and fungi.
B) In sexual reproduction, individuals transmit 50% of their genes to each of their offspring.
C) In asexual reproduction, offspring are produced by fertilization without meiosis.
D) Asexual reproduction produces only haploid offspring.

6. ____ At which stage of mitosis are chromosomes usually photographed in the preparation of a karyotype?
A) prophase
B) metaphase
C) anaphase
D) telophase

7. ____ Which of the following is true of a species that has a chromosome number of $2n = 16$?
A) The species has 16 sets of chromosomes per cell.
B) Each cell has eight homologous pairs.
C) During the S phase of the cell cycle there will be 32 separate chromosomes.
D) A gamete from this species has four chromosomes.

8. ____Eukaryotic sexual life cycles show tremendous variation. Which of the following elements do all sexual life cycles have in common?

I. alternation of generations
II. meiosis
III. fertilization
IV. gametes
V. spores

A) I, IV, and V
B) I, II, and IV
C) II, III, and IV
D) II, IV, and V

9. ____ Which of these statements is true?
A) In humans, the 23rd pair, the sex chromosomes, determines whether the person is female (XX) or male (XY).
B) Single, haploid (*n*) sets of chromosomes in ovum and sperm unite during fertilization, forming a haploid (*n*), single-celled zygote.
C) At sexual maturity, ovaries and testes produce diploid gametes by meiosis.
D) Sexual life cycles among different types of organisms are identical with respect to the relative timing of meiosis and fertilization.

10. ____ The human X and Y chromosomes
A) are both present in every somatic cell of males and females alike.
B) are about the same size and have approximately the same number of genes.
C) are almost entirely homologous, despite their different names.
D) include genes that determine an individual's sex.

11. ____ Which of the following describes a karyotype?
A) a natural cellular arrangement of chromosomes in the nucleus
B) a display of all the cell types in an organism
C) organized images of a cell's chromosomes
D) a display of a cell's mitotic stages

12. ____ Which of the following types of cells would be produced by meiosis?
A) a haploid animal cell
B) a diploid animal cell
C) a diploid plant cell
D) a diploid unicellular organism

13. ____ Which of these is a way that the sexual life cycle increases genetic variation in a species?
A) by allowing crossing over
B) by allowing an increase in cell number
C) by increasing gene stability
D) by conserving chromosomal gene order
E) by decreasing mutation frequency

14. ____ A given organism has 46 chromosomes in its karyotype. We can therefore conclude which of the following?
A) It must be human.
B) It must be an animal.
C) It must be sexually reproducing.
D) Its gametes must have 23 chromosomes.

15. ____ A triploid cell contains three sets of chromosomes. If a cell of a usually diploid species with 42 chromosomes per cell is triploid, this cell would be expected to have which of the following?
A) 63 chromosomes in 31 1/2 pairs
B) 63 chromosomes in 21 sets of 3
C) 63 chromosomes, each with 3 chromatids
D) 21 chromosome pairs and 21 unique chromosomes

16. ____ The somatic cells of a privet shrub each contain 46 chromosomes. To be as different as they are from human cells, which have the same number of chromosomes, which of the following must be true?
A) Privet cells cannot reproduce sexually.
B) Genes of privet chromosomes are significantly different from those in humans.
C) Privet shrubs must be metabolically more like animals than like other shrubs.
D) Genes on a particular privet chromosome, such as the X, must be on a different human chromosome, such as number 18.

17. ____ In a human karyotype, chromosomes are arranged in 23 pairs. If we choose one of these pairs, such as pair 14, which of the following do the two chromosomes of the pair have in common?
A) length and position of the centromere only
B) length, centromere position, and staining pattern only
C) length, centromere position, staining pattern, and traits coded for by their genes
D) length, centromere position, staining pattern, and DNA sequences

18. ____ The karyotype of one species of primate has 48 chromosomes. In a particular female, cell division malfunctions, and she produces one of her eggs with an extra chromosome (25). The most probable source of this error would be a mistake in which of the following?
A) mitosis in her ovary
B) telophase II of one meiotic event
C) telophase I of one meiotic event
D) either anaphase I or II

19. ____ If a cell has completed the first meiotic division and is just beginning meiosis II, which of the following statements describes the contents of this cell?
A) It has half the amount of DNA of the cell that began meiosis.
B) It has the same number of chromosomes, but each of them has different alleles than another cell from the same meiosis.
C) It has half the chromosomes but twice the DNA of the originating cell.
D) It is identical in content to another cell from the same meiosis.

20. ____ Which of the following events might result in a human zygote with 45 chromosomes?
A) an error in either egg or sperm meiotic anaphase
B) failure of the egg nucleus to be fertilized by the sperm
C) an error in the alignment of chromosomes on the metaphase plate
D) multiple crossover events during meiosis I

21. ____ After telophase I of meiosis, the chromosomal makeup of each daughter cell is
A) diploid, and the chromosomes are each composed of a single chromatid.
B) diploid, and the chromosomes are each composed of two chromatids.
C) haploid, and the chromosomes are each composed of a single chromatid.
D) haploid, and the chromosomes are each composed of two chromatids.

22. ____ How do cells at the completion of meiosis compare with cells that have replicated their DNA and are just about to begin meiosis?
A) They have half the number of chromosomes and half the amount of DNA.
B) They have the same number of chromosomes and half the amount of DNA.
C) They have half the number of chromosomes and one-fourth the amount of DNA.
D) They have half the amount of cytoplasm and twice the amount of DNA.

23. ____ Which of the following happens during meiosis I?
A) Homologous chromosomes of a pair are separated from each other.
B) The chromosome number per cell is conserved.
C) Sister chromatids are separated.
D) Four daughter cells are formed.

24. ____ Chromatids are separated from each other during which of the following processes?
A) only during mitosis
B) only during meiosis I
C) only during meiosis II
D) during both mitosis and meiosis II

25. ____ Which of the following events occurs in meiosis but not in mitosis?
A) chromosome replication
B) synapsis of chromosomes
C) production of daughter cells
D) condensation of chromatin

26. ____ During mitosis or meiosis, sister chromatids are held together by proteins referred to as cohesins. Such molecules must have which of the following properties?
A) They must persist throughout the cell cycle.
B) They must be removed before meiosis can begin.
C) They must be removed before sister chromatids or homologous chromosomes can separate.
D) They must be intact for nuclear envelope re-formation.

27. ____ Which of the following structures is found in a pair of homologous chromosomes?
A) two single-stranded chromosomes that have synapsed
B) two sister chromatids that have synapsed
C) four sister chromatids
D) four unique chromosomes

28. ____ To visualize and identify meiotic cells at metaphase I with a microscope, what would you look for?
A) sister chromatids of a replicated chromosome grouped at the poles
B) individual chromosomes all at the cell's center
C) an uninterrupted spindle array
D) pairs of homologous chromosomes all aligned at the cell's center

For questions 29-31, match the key event of meiosis with the stages listed below.

I.	prophase I	V.	prophase II
II.	metaphase I	VI.	metaphase II
III.	anaphase I	VII.	anaphase II
IV.	telophase I	VIII.	telophase II

29. ____ Homologous chromosomes are aligned at the equator of the spindle.
A) I
B) II
C) IV
D) VI

30. ____ Synaptonemal complexes form or are still present.
A) I only
B) I and IV only
C) I and VIII only
D) I, II, III, and IV only

31. ____ Centromeres of sister chromatids disjoin and chromatids separate.
A) III
B) IV
C) V
D) VII

32. ____ For a species with a haploid number of 23 chromosomes, how many different combinations of maternal and paternal chromosomes are possible for the gametes?
A) 23
B) 46
C) 460
D) approximately 8.4 million

33. ____ Independent assortment of chromosomes during meiosis is a result of
A) the random and independent way in which each pair of homologous chromosomes lines up at the metaphase plate during meiosis I.
B) the random nature of the fertilization of ova by sperm.
C) the random distribution of the sister chromatids to the two daughter cells during anaphase II.
D) the relatively small degree of homology shared by the X and Y chromosomes.

34. ____ During which process does independent assortment of chromosomes occur?
A) during mitosis only
B) during meiosis I only
C) during meiosis II only
D) during mitosis and meiosis I

35. ____ When homologous chromosomes cross over, what is the result?
A) Two sister chromatids get tangled, resulting in one altering the sequence of its DNA.
B) Two sister chromatids exchange identical pieces of DNA.
C) Specific proteins break the two strands of nonsister chromatids and re-join them.
D) Each of the four DNA strands of a homologous pair is broken, and the pieces are mixed.

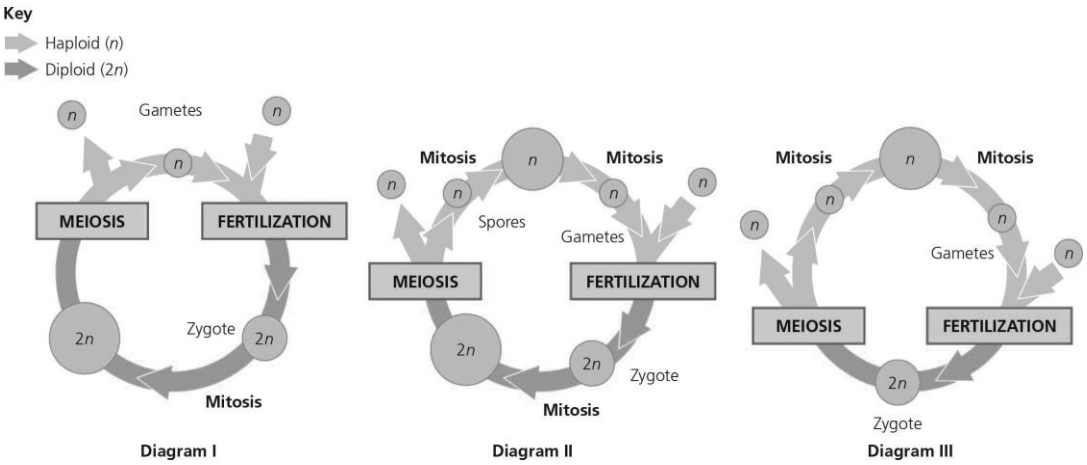

Figure 10.1

36. ____ Refer to the life cycles illustrated in Figure 10.1. Which of the life cycles is (are) typical for animals?
A) I only
B) II only
C) III only
D) I and II

37. ____ Refer to the life cycles illustrated in Figure 10.1. Which of the life cycles is (are) typical for plants and some algae?
A) I only
B) II only
C) III only
D) I and II

38. ____ Refer to the life cycles illustrated in Figure 10.1. Which of the life cycles is (are) typical for most fungi and some protists?
A) I only
B) II only
C) III only
D) I and III

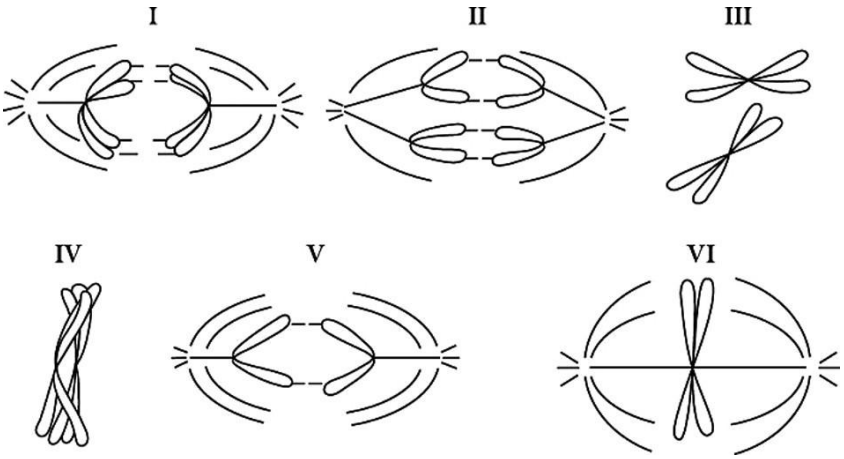

Figure 10.2

39. ____ Refer to the drawings in Figure 10.2 of a single pair of homologous chromosomes as they might appear during various stages of either mitosis or meiosis. Which diagram represents anaphase I of meiosis?
A) I
B) II
C) IV
D) V

40. ____ Refer to the drawings in Figure 10.2 of a single pair of homologous chromosomes as they might appear during various stages of either mitosis or meiosis. Which diagram(s) represent(s) anaphase II of meiosis?
A) II only
B) III only
C) V only
D) either II or V

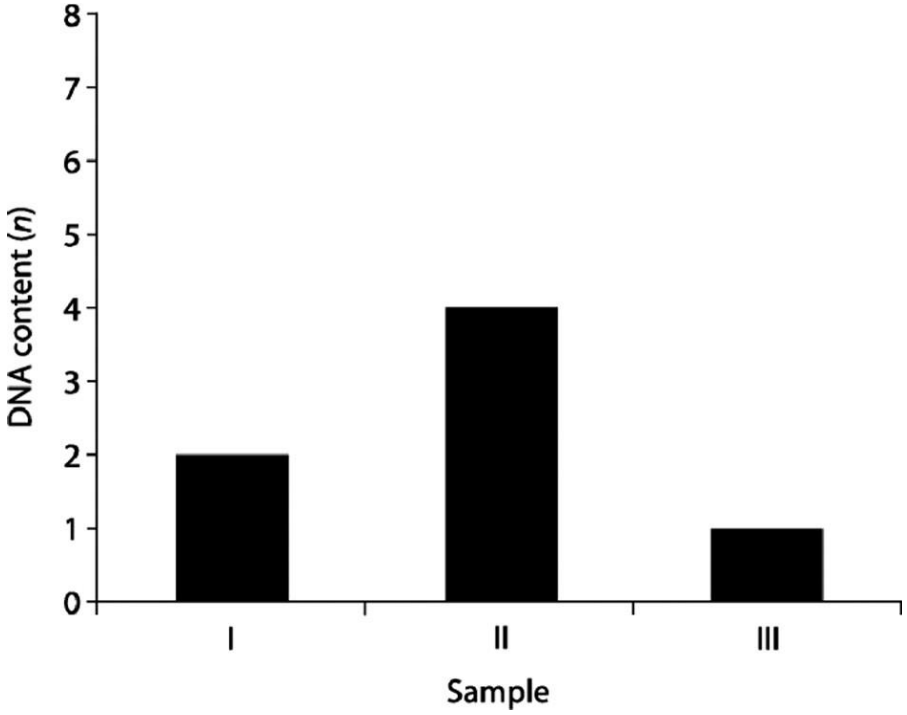

Figure 10.3

41. ____ You have isolated DNA from three different cell types of an organism, determined the relative DNA content for each type, and plotted the results on the graph shown in Figure 10.3. Which sample(s) of DNA might be from a skin cell arrested in G_0 of the cell cycle?
A) I
B) II
C) either I or II
D) either I or III

42. ____ You have isolated DNA from three different cell types of an organism, determined the relative DNA content for each type, and plotted the results on the graph shown in Figure 10.3. Which sample(s) might represent an animal cell in the G_2 phase of the cell cycle?
A) I
B) II
C) III
D) both I and II

43. ____ You have isolated DNA from three different cell types of an organism, determined the relative DNA content for each type, and plotted the results on the graph shown in Figure 10.3.
Which sample(s) might represent a zygote?
A) I
B) II
C) III
D) either I or II

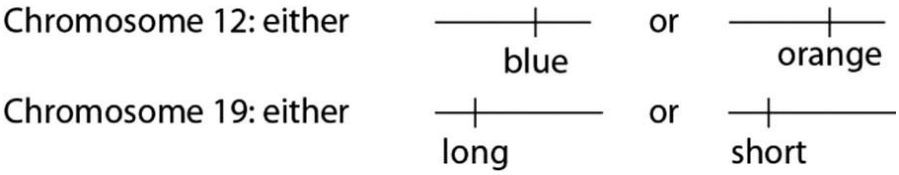

Figure 10.4

44. ____ A certain (hypothetical) organism is diploid, has either blue or orange wings as the consequence of one of its genes on chromosome 12, and has either long or short antennae as the result of a second gene on chromosome 19, as shown in Figure 10.4. A certain female's number 12 chromosomes both have the blue gene and number 19 chromosomes both have the long gene. As cells in her ovaries undergo meiosis, her resulting eggs (ova) may have which of the following?
A) either two number 12 chromosomes with blue genes or two with orange genes
B) either two number 19 chromosomes with long genes or two with short genes
C) either one blue or one orange gene in addition to either one long or one short gene
D) one chromosome 12 with one blue gene and one chromosome 19 with one long gene

45. ____ A certain (hypothetical) organism is diploid, has either blue or orange wings as the consequence of one of its genes on chromosome 12, and has either long or short antennae as the result of a second gene on chromosome 19, as shown in Figure 10.4. If a female of this species has one chromosome 12 with a blue gene and another chromosome 12 with an orange gene, and has both number 19 chromosomes with short genes, she will produce which of the following egg types?
A) only blue short gene eggs
B) only orange short gene eggs
C) one-half blue short and one-half orange short gene eggs
D) three-fourths blue short and one-fourth orange short gene eggs

Please use the following information to answer questions 46-47.

There is a group of invertebrate animals called rotifers, among which a particular group of species reproduces, as far as is known, only asexually. These rotifers, however, have survived a long evolutionary history without evidence of having been overcome by excessive mutations.

46. ____ Because the rotifers develop from eggs, but asexually, what can you predict?
A) The eggs and the zygotes are all haploid.
B) The animals are all males.
C) Although asexual, both males and females are found in nature.
D) No males can be found.

47. ____ How is natural selection related to sexual reproduction as opposed to asexual reproduction?
A) Sexual reproduction results in many new gene combinations, some of which will lead to differential reproduction.
B) Sexual reproduction results in the most appropriate and healthiest balance of two sexes in a population.
C) Sexual reproduction results in the greatest number of new mutations.
D) Sexual reproduction allows the greatest number of offspring to be produced.

48. ____ A human cell containing 22 autosomes and a Y chromosome is
A) a sperm.
B) an egg.
C) a zygote.
D) a somatic cell of a male.

49. ____ If the DNA content of a diploid cell in the G_1 phase of the cell cycle is represented by *x*, then the DNA content of the same cell at metaphase of meiosis I would be
A) 0.25*x*.
B) 0.5*x*.
C) *x*.
D) 2*x*.

50. ____ If we continued to follow the cell lineage from question 3, the DNA content of a cell at metaphase of meiosis II would be
A) 0.25*x*.
B) 0.5*x*.
C) *x*.
D) 2*x*.